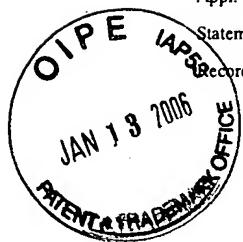


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Appl. No. 10/816,302

Statement dated 10 January 2006

Record of Telephone Communication of 29 Dec 2005



## In The United States Patent And Trademark Office

Application Number: 10/816,302  
Application Filed: 2004 April 02  
Applicants: Carl Sawtell, Paolo Menegoli  
Title: Motor Positioning Servo Loop Using Oversampling Bitstream DAC  
Examiner: Patrick Miller

San Jose, 2006 January 10

### STATEMENT OF SUBSTANCE OF INTERVIEW

Assistant Commissioner for Patents  
Washington, District of Columbia 20231

Sir:

In accordance with MPEP Section 713.04, this communication is a record of the telephone interview between the inventors (Carl Sawtell and Paolo Menegoli) and examiner Patrick Miller which took place on the morning of 29 December 2005.

The subject of the conversation was the rejection of claims 7 and 13 in light of prior art Bibyk and Kobayashi. A description of the substance of the interview follows:

The primary subject of discussion was prior art Bibyk. The applicants conceded that

1. Bibyk has inputs and outputs that are physical phenomenon which may include motors, loudspeakers etc.
2. Bibyk clearly teaches the use of oversampled, sigma-delta type data conversion

At issue was whether this prior art was relevant. The applicants argued that Bibyk is not in the field of closed-loop servo systems

3. Although figure 1 of Bibyk shows inputs and outputs both coupled to a general physical world, he neither indicates nor implies that the output and input are so coupled to form a closed loop.
4. Bibyk's system lacks key features that would be required in order to form a closed loop system, in particular a means for compensation for the overall loop stability.

After discussing some historical issues in motor control systems, the applicant argued that

5. Designers of closed loop systems view oversampled systems as "signal processing" architectures. (i.e. having application in fields such as codecs for transmitting video and audio signals)
6. The oversampled techniques are generally assumed to have problems such as latency, a characteristic that is very typical of codec systems and undesirable in closed loops.
7. Previous work in servosystem with "one bit" DACs, which were simple PWM in nature, have been abandoned as being low performance and having noise problems.

With respect to the present invention, it was explained that

8. The raw sigma-delta modulator in the present invention, which lacks any explicit high-order filtering (and in particular lacking high-delay FIR filtering), gives virtually no latency, typically less than the Nyquist DACs typically used in motor control.

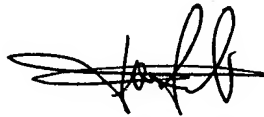
9. Unlike PWM DACs which have low resolution, oversampled one-bit DACs can achieve linearity/resolution that surpasses the state-of-the-art Nyquist DACs.

10. Applicants explained that because of the manner in which we insert the DAC into the loop, using the inherent low-pass nature of the control loop to act as a reconstruction filter, we achieve an unexpected simplicity combined with a level of performance that is unexpected by those skilled in the art of motor control servo loops.

Very respectfully,



**Carl Sawtell**



**Paolo Menegoli**